

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the matter of

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| WIRELESS TELECOMMUNICATIONS BUREAU AND |) | |
| OFFICE OF ENGINEERING AND TECHNOLOGY |) | GN Docket No. |
| SEEK COMMENT ON PETITIONS FOR RULEMAKING |) | 12-354 |
| REGARDING THE CITIZENS BROADBAND RADIO SERVICE |) | |

COMMENTS OF CASA SYSTEMS

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Summary

The petitions for rulemaking are seeking changes to the Part 96 rules for the CBRS band to enhance the Primary Access Licenses, primarily:

- To provide Primary Access Licensees access to the full band
- To provide Extended terms for the Primary Access Licenses
- To provide larger geographic areas for each Primary Access License
- To provide an expectation of renewal for the Primary Access Licenses

Casa does not support these changes, and recommends that the Commission not begin a rulemaking to consider them. As we will discuss below, we believe that these changes are intended to make the CBRS band more like a licensed band, and various reasons for such changes are put forward in the petitions.

We believe those reasons to be generally not compelling; rather, we believe that the current CBRS band rules strike the appropriate balance between “licensed-like” and “unlicensed-like” use of the band.

Background and Introduction

Casa hereby submits these comments in response to the Public Notice issued by the FCC’s Wireless Telecommunications Bureau and the Office of Engineering and Technology seeking comments on the Petitions for Rulemaking filed by CTIA and T-Mobile regarding the Citizens Broadband Radio Service.¹

Casa Systems is a leading provider of fixed, mobile, optical and Wi-Fi network solutions for ultra-broadband services, which require over 1 Gbps throughput today and will require 10 Gbps or more within the next decade. We are focused on, and passionate about, enabling these services, regardless of access network type.

Casa Systems was founded in 2003, and is headquartered in Andover, Massachusetts. The company has more than 600 employees worldwide, with a customer base that includes MNOs, MVNOs, MSOs, and fixed service providers.

The petitions for rulemaking are based on 3 main points

The petitions for rulemaking filed by CTIA and T-Mobile make three main points which they use to justify the request for new rules from the FCC.

- (1) Central to their argument is that regulators around the world are looking at 3.5 GHz spectrum for 5G applications. In order to be more globally harmonized, they argue, the FCC should make the US 3.5 GHz band look like a classically licensed band. This, they claim, will enable the US to maintain wireless leadership in 5G.
- (2) Both petitioners argue that licensed services are needed in order to provide the quality of service that customers expect and which will be required for 5G.
- (3) Both petitioners argue that the only way to get a robust device ecosystem is to make the band more attractive to licensed mobile operators.

We will address each of these points below.

¹ See WIRELESS TELECOMMUNICATIONS BUREAU AND OFFICE OF ENGINEERING AND TECHNOLOGY SEEK COMMENT ON PETITIONS FOR RULEMAKING REGARDING THE CITIZENS BROADBAND RADIO SERVICE, Public Notice, GN Docket No. 12-354, released June 22, 2017. (“Public Notice”)

“5G” is not the same thing as “licensed services”

Both petitions make the argument that because the 3.5 GHz band is being targeted for 5G services, the band should be made more available to licensed operators. T-Mobile states that “in order for T-Mobile and others to make the 3.5 GHz band a success, the Commission must modify its rules to enhance the utility of the band for 5G licensed services.”² Similarly, CTIA writes that “[t]he 3.5 GHz band is the only mid-band spectrum targeted for 5G use in the U.S., and the targeted changes sought here will create an investment environment for the 3.5 GHz band to flourish here as other nations target the 3 GHz frequencies for 5G.”³

Both of these comments are premised on the idea that “5G” services will necessarily be provided by licensed mobile operators. While that is undoubtedly true for many of these services, it is by no means true for all of them. In fact, it is very possible that the majority of those services will be provided by innovative, new operators, or by technologies that are deployed without the involvement of a wireless operator.

For example, as part of their filing T-Mobile argues that over the next 3 years there may be as many as 30 billion connected devices deployed, and they use as a reference⁴ this quote from IHS: “IHS forecasts that the IoT market will grow from an installed base of 15.4 billion devices in 2015 to 30.7 billion devices in 2020 and 75.4 billion in 2025.”

Interestingly, this prediction is looking primarily at the IoT market. Two points need to be made in that context:

- 1) “5G” is not the same as the IoT, and
- 2) Even within the IoT it is far from certain that licensed, mobile operators will be the primary providers of connectivity for the market.

5G is not the same as the IoT

It has been clear for some time that unlike previous generations of wireless technology that have come before it, 5G covers much more area in terms of use cases and applications. In previous generations of mobile technology, the focus was on the implementation of digital voice (2G), true mobile data (3G), and the mobile Internet (4G). With 5G, however, we have a large number of use cases involving users, some of whom are not even people, just other devices. The number of attempts to describe “5G” is

² T-Mobile, Petition for Rulemaking, GN Docket 12-354, filed June 19, 2017. (“T-Mobile Petition”) p3

³ CTIA, Petition for Rulemaking, GN Docket 12-354, filed June 16, 2017. (“CTIA Petition”) p3

⁴ T-Mobile Petition, footnote 18

trending towards infinite, but for example, a presentation from Qualcomm at the NIST Workshop on Named Data Networking⁵ identifies the following use cases as falling under the 5G umbrella:

- Enhanced mobile broadband
- Wearable devices/sensors
- Smart homes, buildings, and cities
- Autonomous vehicles and object tracking
- Infrastructure monitoring and control (e.g. “Smart Grid”)
- Remote control and process automation

In addition to these, an aspect of 5G is the merger of wireless with fixed broadband access. Many of the 5G activities in the US are currently aimed at using 5G technologies to provide high speed fixed wireless access.

The “Internet of Things”, therefore, is only part of the broader 5G vision, and it is not at all obvious that all of the use cases identified above will be, or need to be, addressed by traditional licensed mobile operators.

The IoT is not a target for only licensed spectrum operators

The IoT, although not the only component of the 5G vision, will be a significant area of investment. A McKinsey report⁶, for example, estimates that the worldwide IoT offers a potential economic impact between \$4 and \$11 trillion a year in 2025. But even if we focus in on just the IoT component of 5G, large fractions of this McKinsey estimate highlight areas that are by no means obvious targets for mobile operators, including factories, retail, homes, offices, worksites, and human. While some of the settings (cities, outside, and vehicles) are places where mobile operators may have an advantage in providing a service, Casa does not believe that the Commission should focus regulatory efforts on those mobile operators to the disadvantage of non-traditional operators and technologies.

⁵ See Highlights of 5G and the Internet of Things, NIST Workshop on Named Data Networking, May 31 - Jun 1, 2016, by Vincent D. Park, Senior Director, Engineering, Qualcomm.

⁶ THE INTERNET OF THINGS: MAPPING THE VALUE BEYOND THE HYPE, McKinsey Global Institute, June 2015, <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world>

The Internet of Things offers a potential economic impact of \$4 trillion to \$11 trillion a year in 2025.



¹Adjusted to 2015 dollars; for sized applications only; includes consumer surplus. Numbers do not sum to total, because of rounding.

McKinsey&Company | Source: McKinsey Global Institute analysis

It is not just Casa that believes that some fraction of this market will be addressed by non-traditional operators. Many analysts have made a similar argument. Joe Madden, from Mobile Experts, for example, writes “People talk about the connected home at 5G conferences, predicting 5G lightbulbs and refrigerators and thermostats chatting with each other. Why would anybody mention this topic in the context of 5G? These light bulbs and appliances currently use Bluetooth, 802.15.4, and other formats which are cheap and cheerful. Nobody needs low latency or high throughput. There’s no room in the business chain for a mobile operator because it’s a local network. Using these applications to justify 5G is simply wishful thinking.”⁷

New Street Research has written that they “don’t include ‘the Internet of Things’ or any of its related themes as ‘key features of 5G’ even though they receive the majority of attention in most industry and

⁷ <http://www.fiercewireless.com/tech/madden-5g-iot-market-will-disappoint-you>

press coverage of what 5G will become. Telecoms investors should ignore the noise on this front because it is unlikely to translate into much value for operators...”⁸

These are not outlier opinions, as can be seen from numerous other headlines: “Even if IoT hits 20bn devices by 2020 mobile operators still won't care”⁹, “Mobile networks facing competition for IoT traffic”¹⁰, etc.

The point here is not to disparage the ability of the mobile network operators to compete in the 5G area, especially in the area of IoT. They may very well play a significant role, and Casa is developing products that mobile operators can use to compete in that market. It is, rather, to point out that “5G” is a large umbrella over many use cases. And even within the single use case of “IoT”, there are sub-cases which may, or may not, be best addressed by a traditional licensed wireless operator model. We do not believe that tilting the regulatory environment too far towards the exclusive license model would be the right thing to do for this upcoming, and still uncertain, market.

More licensed spectrum is not required for high-quality services

In their petitions, both petitioners argue that exclusively licensed spectrum is required in order to provide a high quality service. “While T-Mobile appreciates that the current rules provide for 3.5 GHz spectrum to be available on a licensed-by-rule basis, exclusive licensed spectrum models offer a superior user experience due to predictable service quality.”¹¹ Says CTIA, “The PAL model seeks to offer wireless providers the assured access and interference protection they deem essential for the quality of service they offer in today’s highly competitive wireless marketplace.”¹²

It is clear that 5G services will not be provided using only a single spectrum band. In the US 5G applications will be provided in the 3.5 GHz band, but in other bands as well. T-Mobile, for example, has already announced plans to use their 600 MHz licenses to deploy 5G.¹³ And, of course, the FCC has already opened up enormous amounts of 5G spectrum in the 28, 37, 39, and 60 GHz bands.¹⁴

⁸ New Street Research, 5G: Known unknowns: A global investor perspective on the 5G roadmap, Industry Meeting at ACMA, 21 June 2016

⁹ https://www.theregister.co.uk/2016/11/10/iot_data_worth_v_little_mobile_operators/

¹⁰ <http://www.zdnet.com/article/mobile-networks-facing-competition-for-iot-traffic/>

¹¹ T-Mobile Petition, p8

¹² CTIA Petition, page 6

¹³ See T-Mobile to roll out 5G over 600 MHz and other spectrum, FierceWireless, May 2, 2017, 11:23 am. <http://www.fiercewireless.com/5g/t-mobile-to-roll-out-5g-over-600-mhz-and-other-spectrum>

¹⁴ See REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING, GN Docket No. 14-177, In the matter of Use of Spectrum Bands above 24 GHz for Mobile Radio Services, adopted July 14, 2016.

And since there will be so much spectrum used, some of it traditionally licensed, and others using different sharing models, the traditional wireless operators will be able to combine operations in the 3.5 GHz band with operations in other bands (if necessary) to provide high quality services using any, or all, of that spectrum. We believe that this will be possible based on what the mobile operators themselves have said in recent, related proceedings. As has been highlighted in the recent discussions at the FCC regarding the deployment of technologies such as LTE-U, traditional wireless operators have made it clear that the use of unlicensed, or shared, spectrum can still make for high quality experiences.

For example, T-Mobile stated “T-Mobile has a long history of using Wi-Fi as a critical component of its network. In addition to ensuring that all T-Mobile customers will be able to obtain mobile devices with Wi-Fi calling and texting capabilities, T-Mobile’s Wi-Fi Un-leashed features the T-Mobile “Personal CellSpot,” a new device that enables T-Mobile customers to put the capabilities of a personal T-Mobile tower in their house. The Personal CellSpot delivers a “full-bars” T-Mobile experience, with unique *patent-pending technology that prioritizes voice calls to first use 5 GHz band Wi-Fi for crystal clear high-definition voice...*”¹⁵

In their comments in the LTE-U proceeding, CTIA¹⁶ touted among the advantages of LTE-U “reduced latency”, which is one of the definitions of a high-quality service. In their June 11, 2015 filing in the same proceeding, CTIA writes that “Furthermore, use of LTE technology will help to facilitate seamless transitions between unlicensed and licensed spectrum, further increasing the quality of service for consumers.”¹⁷

It seems clear that the traditional licensed operators have become comfortable with the idea of supplementing their networks with spectrum that is regulated under different regimes, be it traditionally licensed or even unlicensed. They have made it clear that their use of unlicensed spectrum will increase the QoS they can provide to customers. We are therefore confident that using CBRS spectrum either as a PAL or in the GAA tier, coupled with other available spectrum assets, will allow the traditional licensed operators to provide the high-quality experience their customers need.

¹⁵ T-Mobile Comments in Docket ET 15-105, June 11, 2015. Italics have been added.

¹⁶ Ex-parte presentation of CTIA in ET Docket 15-105. Filed as a letter to the FCC, May 28, 2015, from Brian M. Josef.

¹⁷ See Comments of CTIA – The Wireless Association®, ET-Docket No. 15-105, filed June 11, 2015, page 5.

Robust device ecosystems do not require licensed operators to develop

In both petitions the petitioners state their belief that unless the spectrum is made more attractive to licensed operators, a robust device ecosystem cannot develop, because the operators will not have the incentive to invest. T-Mobile states “the viability of the device ecosystem for the band will depend on licensee investment. That investment will be limited unless the Commission maximizes the use of the band for licensed 5G operations.”¹⁸ And from CTIA, “One recent study estimates that wireless operators will invest \$275 billion dollars in 5G over seven years and projects that 5G will boost the U.S. GDP by \$500 billion. But this can only occur if government sets policies that welcome investment.”¹⁹

First of all, it is quite clear that robust device ecosystems for wireless devices can develop even in places where traditional licensed operators do not participate. The most obvious example of this is the extremely robust device ecosystem that has developed for the unlicensed bands, by which we do not mean only Wi-Fi. According to ABI Research, “Annual wireless connectivity chipset shipments across Bluetooth, Wi-Fi, NFC, GPS, and ZigBee show no sign of slowing down, reaching almost nine billion annual shipments in 2019... Had it not been for combo chipsets and integrated platforms the number of chipsets shipped would have been even higher. Cumulative chipset shipments from 2010 through 2014 will have reached over 21 billion; during the next five years from 2015 to 2019, cumulative shipments will almost double to over 39 billion. ‘That is over 60 billion wireless connectivity chipsets that will have shipped over the ten year span from 2010 to 2019, driven by the emergence of new device types,’ said research director Philip Solis. ‘There is constant change in the wireless connectivity space across wireless connectivity technologies, versions of technologies, and levels of integration at the same time.’”²⁰

Second, Casa is not convinced that the wireless operators would require changes to the spectrum regulations in order to see fit to invest in technologies for this space. Although T-Mobile says that “T-Mobile does not believe there is a business case to invest in the development of a network without adequate regulatory assurance that the basic element of the network – the underlying spectrum assets – will continue to be available to it,”²¹ this statement is belied by T-Mobile’s own actions. T-Mobile is one of the most vocal advocates of technologies that merge licensed and unlicensed technologies, such

¹⁸ T-Mobile Petition, page 4.

¹⁹ CTIA Petition, page 5.

²⁰ Nearly 9 Billion Wireless Connectivity Chipsets to Ship during 2019 Alone, ABI Research, May 22, 2014. <https://www.abiresearch.com/press/nearly-9-billion-wireless-connectivity-chipsets-to/>

²¹ T-Mobile Petition, p12

as LTE-U and LAA, and unlicensed spectrum is the definition of a spectrum asset whose availability cannot be assured.

On June 26th, T-Mobile announced²² “the nation’s first live commercial network test of License Assisted Access (LAA)”. In the same announcement T-Mobile states that it is “the first national wireless provider to make LTE-U available to customers.” They write that “LAA is just the latest example of how T-Mobile is innovating the way forward. While our competitors scramble to deal with the way unlimited data plans are slowing down their networks, we’re already moving on to what’s next,” said Neville Ray, CTO at T-Mobile. “This means that the fastest LTE network – that’s T-Mobile – will only get faster.”

In conclusion, we believe that

- “5G” services will be delivered by both traditional and non-traditional wireless operators, and the same can even be said for enabling the specific use case of the IoT
- Although there is no doubt that mobile operators will invest heavily in 5G as suggested by CTIA, and that that investment will be a benefit to the US economy, those operators are not the only key to 5G investment.
- Mobile operators have become comfortable with, and adept at, deploying high quality services over spectrum that is either wholly unlicensed, or a combination of licensed and unlicensed spectrum. The current CBRS rules will not act as an impediment to their investing in technologies that make use of the 3.5 GHz band as well.

Casa’s view of the market

As mentioned above, Casa was established in 2003 and, at that time, was focused entirely on the cable CMTS market. However, for the past 4 years Casa has been developing wireless products as well. In addition to cable network solutions, including DOCSIS 3.0/3.1 CCAP and Distributed Access, Casa’s ultra-broadband portfolio includes mobile edge computing solutions, licensed small cells, transport security and Wi-Fi. With our solutions, service providers can offer rich customer experiences that are fueled by high-performance broadband, span seamlessly across multiple access networks, and are defined and optimized using software intelligence.

²² T-Mobile Completes Nation’s First Live Commercial Network Test of License Assisted Access (LAA), June 26, 2017, <https://newsroom.t-mobile.com/news-and-blogs/lte-u.htm>

Over the past year or so, we have noticed that our small cell customers are showing significant interest in both 5G applications and the CBRS band. We have seen interest in many of the use cases defined by the CBRS Alliance, including

- Private cellular + Private LTE (including the Industrial IoT cases with the addition of cellular IOT attached Cat-M1 and NB-IOT devices),
- MNO Capacity Augmentation,
- MSO MVNO opportunity,
- Neutral Host solutions, and
- Fixed Wireless

Casa is actively discussing several of these use cases with both traditional licensed spectrum operators and also non-traditional operators, including multiple MSOs, fixed wireless operators, and various wireless service providers.

Conclusion

The wireless industry has always been one of rapid change, and now is no different. New technologies have enabled mobile services to migrate up in frequency, even possibly into the mm-wave bands. New applications are being enabled, and these applications such as enhanced mobile broadband, the IoT, fixed wireless broadband, and others, are driving the development of a new generation of wireless technologies called 5G. More and more capable devices are making it possible to deliver these new applications across a variety of spectrum bands, either bonded together or acting separately. New regulatory schemes, in addition to exclusive licensing and licensing by rule, are being tried out to take advantage of the changing technology and application landscape.

In Casa's view, the FCC has struck the right balance between the PALs and the GAA in its innovative three-tiered licensing scheme for the 3.5 GHz CBRS band. Based on the feedback we have from the market, there is high interest in this band given its current structure. While there are many applications that might best be addressed by traditional wireless operators, we see just as much interest from non-traditional operators. Not only do the existing rules not damage the US prospects to lead in the area of 5G, Casa believes that other regulators are watching the US experiment closely and may choose to follow the US lead.

In our opinion, the proposed changes to the rules suggested by CTIA and T-Mobile would tilt too far in the direction of making the 3.5 GHz band a licensed spectrum band. Auctioning off all of the spectrum in the band as PALs, expanding the license term to 10 years *with an expectation of renewal*, and

increasing the size of a license area to encompass Partial Economic Areas²³ would likely lead to only a small number of the traditional licensed spectrum operators being able to use the CBRS band. Casa would prefer that the rules in this band remain amenable to **both** the traditional licensed wireless operators **as well as to** non-traditional operators who may be looking to provide some part of the broad set of services under the 5G umbrella. Casa Systems hopes to continue to develop products that would be suited for any of these types of operators, and we believe that the Commission's current rules do a good job of enabling both traditional and non-traditional operators to gain access to the spectrum.

We therefore respectfully request that the Commission not proceed with a rulemaking based on these petitions.

Respectfully submitted,

A handwritten signature in blue ink, reading "Leigh M. Chinitz".

Leigh M. Chinitz, Ph.D.
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Dated: July 24, 2017

²³ T-Mobile Petition, page 4.